REMARKS/ARGUMENTS

I. Introduction:

Claims are amended herein. Claims 1, 4, 7-9, 11, 14-15, 19-20, 22-25, 27-31, and 33- 47 are currently pending.

II. Claim Rejections – 35 U.S.C. §101:

Claims 19 and 22 have been amended to remove "data signal embodied in a carrier wave". As amended, claims 19 and 22 are believed to comply with 35 U.S.C. 101.

III. Claim Rejections – 35 U.S.C. §103:

Claims 1, 4, 8, 9, 11, 14, 15, 19, 20, 22, 23, 25, 27, 29, 31, and 33-47 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0097726 (Garcia-Luna-Aceves et al.) in view of U.S. Patent Application Publication No. 2002/0073224 (Varma et al.).

Claim 1 is directed to a method of estimating periodic worst-case delay for a traffic aggregate having an associated rate. The method includes, inter alia, collecting traffic data at a queue, calculating a burst-rate traffic profile responsive to the collected traffic data and the associated rate, and calculating a periodic worst-case delay. Claim 1 has been amended to clarify that the periodic worst-case delay is calculated by dividing the burst parameter by a share of output link bandwidth allotted to the queue and that the share of output link bandwidth is greater than or equal to the associated rate.

As described in the specification, the associated rate is a specified bandwidth, which may be, for example, a negotiated rate agreed to by a customer sending traffic data. This value is used to calculate the burst-rate traffic profile and a burst parameter. After traffic is queued, it is sent out of the router on an output link. The output link has as associated output link bandwidth. Multiple queues can share an output link, with each

queue allotted a share of the output link bandwidth. It is this share of the output link bandwidth that is used to calculate the worst-case delay. Applicants' invention, as set forth in the claims is particularly advantageous in that it allows for the worst-case delay to be analyzed under hypothetical conditions such as different output link bandwidth allocations. For example, a service provider can use the calculated worst-case delay to determine how much additional bandwidth to allocate to a class to achieve a desired decrease in delay. In another example, the associated rate can be set to a hypothetical negotiated rate and similar calculations performed.

Applicants' respectfully submit that neither Garcia-Luan-Aceves et al. nor Varma et al., either alone or in combination, show or suggest a method or system for estimating worst-case delay, as set forth in the claims.

Garcia-Luan-Aceves et al. disclose a method for maintaining reservation state in a network router. The Examiner first cites paragraphs [0016], [0054], [0066], and [0089] with respect to collecting traffic comprising packet size and arrival time over a time interval. As noted at paragraph [0054], routers only know the rates of incoming traffic on the links and the rates of outgoing traffic for each destination, they do not maintain information on the rates of each flow. Paragraph [0016] notes that the invention provides techniques that replace per-flow state and per-flow processing with mechanisms whose complexity is determined by the network parameters. Paragraph [0066] refers to how classes are based on packet sizes. A shaper is used to shape flows to a form (L, ρ), where L is the maximum size of any packet of the flow and ρ is the rate of the flow. Paragraph [0089] describes classes based on burst-drain-times, which is the time to transmit one bucket at the rate of the flow. The Examiner has failed to point to any teaching of collecting traffic data at a queue of a router, the queue associated with a traffic aggregate over a time interval, and the traffic data comprising packet size and arrival time of each packet arriving at the queue during the time interval, as required by claim 1.

With regard to calculating a burst-rate traffic profile responsive to the traffic data collected at the associated rate, the Examiner cites paragraph [0063]. This section of the Garcia-Luan-Aceves et al. patent defines a delay for the flow as the waiting time at the

shaper at the ingress node and the propagation delays of the links on the flow's path (see equation in paragraph [0063]. Claim 1 requires that the associated rate is a specified bandwidth for the traffic aggregate. Garcia-Luan-Aceves et al. use ρ, which is the average rate of the flow of incoming traffic (see, paragraph [0054]).

The Examiner cites the same equation and parameters from Garcia-Luan-Aceves et al. for calculating a burst parameter and calculating a burst-rate traffic profile (paragraph [0063]). As previously discussed, claim 1 specifies that the periodic worst-case delay is calculated by dividing a burst parameter based on an associated rate, by a share of output link bandwidth allotted to the queue. Garcia-Luan-Aceves et al. simply show a flow delay calculated using a maximum burst size of flow of incoming traffic divided by the average rate of the flow of the incoming traffic (see, paragraphs [0054], [0063], and Fig. 1). Applicants note that on page 4 of the Office Action, the Examiner states that Garcia-Luan-Aceves et al. do not expressly indicate calculating a periodic worst-cast delay for the burst-rate traffic profile by dividing a burst parameter by an allocated bandwidth associated with the queue.

Varma et al. describe a method for determining burstines of a traffic source. The Examiner cites paragraph [0067] with regard to collected traffic data. Paragraph [0067] describes how active periods are determined by traversing a sequence of frames and computing the queue size after each frame arrives. Varma et al. do not collect packet size and arrival time for each packet. In contrast, Varma et al. compute a queue size at certain periods to determine active periods of a stream.

The Examiner cites paragraph [0015] of Varma et al. with regard to calculating a delay. Paragraph [0015] describes a latency rate model in which the worst case delay bound of several schedulers of a tandem network is determined by dividing the queue size by the average source rate and adding the latency at each scheduler (see, also paragraphs [0010]-[0013]). Varma et al. thus do not show or suggest calculating a periodic worst-case delay by dividing a burst parameter based on a specified bandwidth for traffic aggregate at a queue, by a share of output link bandwidth allotted to the queue. Moreover, neither reference shows or suggests a share of output link bandwidth (used to calculate the worst-

case delay) that is greater than or equal to an associated rate (specified for a traffic aggregate).

Accordingly, claim 1 is submitted as patentable over Garcia-Luna-Aceves et al. and Varma et al.

Claims 4, 7, 8, and 33-41, depending either directly or indirectly from claim 1, are submitted as patentable for at least the same reasons as claim 1.

With regard to claims 4 and 37, Garcia-Luna-Aceves et al. do not show or suggest a negotiated rate agreed to by a customer sending the traffic data or a maximum average bandwidth specified in a service level agreement. The Examiner cites paragraph [0053] of the Garcia-Luna-Aceves et al. patent application. This paragraph describes token-bucket parameters for input flow, which include a maximum burst size and an average rate of flow. Garcia-Luna-Aceves et al. do not specify the source of these values. Furthermore, if the Examiner is using this value as the associated rate, as defined in claim 1, then the equation using these parameters in paragraph [0063] would teach away from applicants' invention, in which the worst-case delay is calculated using a share of output link bandwidth allotted to the queue and not the associated rate, which is instead used in calculating the burst parameter.

Claims 40 and 41 are further submitted as patentable over the cited references which do not show or suggest calculating error of data by comparing collected data to the burst-rate traffic profile. In rejecting these claims the Examiner refers to paragraph [0089] of the Garcia-Luna-Aceves et al. patent. This paragraph describes how flows with the same burst-drain-times can be merged without changing the burst-drain-time of the resulting flows. There is no discussion of calculating error of data or comparing collected data to a burst-rate traffic profile.

Claim 9 is directed to a method of estimating worst-case queuing delay along a path. The method includes collecting a rate parameter and a burst parameter. As previously discussed, neither Garcia-Luna-Aceves et al. nor Varma et al. show or suggest calculating a periodic worst-case delay, as set forth in the claims. Moreover, these

references do not teach adding up a periodic worst-case delay associated with routers along a path, as required by claim 9.

Accordingly, claim 9 is submitted as nonobvious over the cited references.

Claim 11 specifies calculating a burst parameter and a burst-rate traffic profile, claims 14 and 27 require code that causes a processor to calculate a burst parameter and code that causes the processor to calculate a burst-rate traffic profile, and claim 23 specifies means for calculating a burst parameter for the collected traffic and means for calculating a burst-rate traffic profile. Claims 12, 14, 23, and 27, and the claims depending therefrom, are submitted as patentable for at least the reasons discussed above with respect to claim 1.

Claims 20 and 29 specify code that causes the processor to receive burst and rate traffic parameters. Claim 25 requires means for periodically collecting rate and burst traffic parameters. Claim 31 specifies that the periodic worst-case delay is based on a burst parameter and a rate parameter. Claims 20, 25, 29, and 31, and the claims depending therefrom, are submitted as patentable for the reasons previously discussed with respect to claim 9.

IV. Conclusion:

For the foregoing reasons, applicant believes that all of the pending claims are in condition for allowance and should be passed to issue. If the Examiner feels that a telephone conference would in any way expedite the prosecution of the application, please do not hesitate to call the undersigned at (408) 399-5608.

Respectfully submitted,

Cindy S. Kaplan
Reg. No. 40,043

P.O. Box 2448
Saratoga, CA 95070
Tel: 408-399-5608
Fax: 408-399-5609